Manual

CANcaseXL
CANcaseXL log

Version 5.1

English

vector

Imprint

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1 Introduction

In this chapter you find the following information:

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1.1 About this User Manual

To find information quickly

This user manual provides you with the following access help:

- ➔ At the beginning of each chapter you will find a summary of the contents
- ➔ In the header you can see in which chapter and paragraph you are

Conventions

In the two following charts you will find the conventions used in the user manual regarding utilized spellings and symbols.

Style	Utilization
bold	Blocks, surface elements, window- and dialog names of the software. Accentuation of warnings and advices. **[OK]** Push buttons in brackets **File|Save** Notation for menus and menu entries
Microsoft	Legally protected proper names and side notes.
`Source Code`	File name and source code.
Hyperlink	Hyperlinks and references.
<CTRL>+<S>	Notation for shortcuts.

Symbol	Utilization
	Here you can obtain supplemental information.
	This symbol calls your attention to warnings.
	Here you can find additional information.
	Here is an example that has been prepared for you.
	Step-by-step instructions provide assistance at these points.
	Instructions on editing files are found at these points.
	This symbol warns you not to edit the specified file.

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1.1.1 Certification

Certified Quality Management System

Vector Informatik GmbH has ISO 9001:2008 certification. The ISO standard is a globally recognized standard.

1.1.2 Warranty

Restriction of warranty

We reserve the right to change the contents of the documentation and the software without notice. Vector Informatik GmbH assumes no liability for correct contents or damages which are resulted from the usage of the documentation. We are grateful for references to mistakes or for suggestions for improvement to be able to offer you even more efficient products in the future.

1.1.3 Registered trademarks

Registered trademarks

All trademarks mentioned in this documentation and if necessary third party registered are absolutely subject to the conditions of each valid label right and the rights of particular registered proprietor. All trademarks, trade names or company names are or can be trademarks or registered trademarks of their particular proprietors. All rights which are not expressly allowed are reserved. If an explicit label of trademarks, which are used in this documentation, fails, should not mean that a name is free of third party rights.

➔ Windows, Windows XP, Windows Vista, Windows 7 are trademarks of the Microsoft Corporation.

2 CANcaseXL and CANcaseXL log

In this chapter you find the following information:

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2.1 Introduction

CANcaseXL

The CANcaseXL is a USB interface with a powerful 32 bit 64MHz microcontroller from ATMEL with ARM7 Core and two SJA1000 CAN controllers from Philips. It can process CAN messages with either 11-bit or 29-bit identifiers. It is also possible to receive and analyze Remote Frames without any limitations. The CANcaseXL is also capable of generating and detecting Error frames on the bus.

CANcaseXL log

The CANcaseXL log offers the same features as the CANcaseXL, but it can also be used as a data logger for CAN and LIN messages. The logged data is saved on industrial-grade SD cards (see section Memory Card on page 12).

Configuration

The CANcaseXL/log can be configured with the **Vector Hardware Config** tool (**Windows | Start | Settings | Control Panel | Vector Hardware**). Further details about the tool can be found in the separate installation instructions at the end of this manual.

Bus types

Various transceivers are available to interface the CANcaseXL/log to a particular type of bus. These CAN and LIN transceivers can be purchased as plug-in boards (Piggybacks) and can be mounted inside the CANcaseXL/log. For information on installing transceivers please refer to section Replacing Piggybacks on page 15. A list of available Piggybacks is included in the accessories manual on the driver CD: `\Documentation\Accessories_for_Network_Interfaces.pdf`

2.2 Driver Installation

Note: Information on the driver installation process can be found in the separate installation instructions at the end of this manual.

2.3 Connectors

General information

The CANcaseXL has the following connectors:

- USB connector for the usage with PC in Interface Mode
- Binder connector (type 711) for power supply, synchronization and trigger
- two D-SUB9 connectors for independent CAN/LIN operation

The CANcaseXL log also has:

- an SD card slot for data logging

Note: In Interface Mode, the SD card cannot be accessed if bus activities take place or if an application accesses the device.

Note: The CANcaseXL log is delivered with a 2GB SD card.

2.3.1 USB Connector

Description

The CANcaseXL/log is connected to an USB port which also supplies the CANcaseXL/log in Interface Mode.

2.3.2 Binder Connector

Description

If the USB port is not capable of supplying the required 500 mA operating current, the CANcaseXL/log may be optionally supplied by an external power supply. The CANcaseXL/log provides a 3-pin Binder connector for this purpose. Available power supplies can be found in the accessories manual on the driver CD.

Pin	Assignment
1	Voltage supply 7 V…33 V (recommended 12 V)
2	Synchronization line / external trigger input
3	Ground

Warning: It is recommended to connect the logger to the same voltage supply (e.g. battery of the vehicle) as the vehicle or test equipment.

If two different voltage supplies are being used for logger and test equipment, the ground (GND) pins of the two voltage supplies must be connected.

2.3.3 External Trigger Input (CANcaseXL log only)

Description

In Logging Mode, pin 2 of the 3-pin Binder connector acts as a trigger input. You can initiate triggers by pulling down pin 2 to GND. The trigger input is low active, i.e. a trigger occurs by a falling edge.

Warning: The external trigger input is designed for 5 V (TTL) and must not be tied to 12 V!

2.3.4 D-SUB9 Connector

Description

The CANcaseXL/log is connected to the CAN or LIN bus (Channel1 and Channel2) via a 9-pin D-SUB socket. The pin assignments of the D-SUB9 connectors depend on the Piggybacks being used. Further information can be found in the accessories manual on the driver CD.

2.4 Synchronization

Note: Further information on the synchronization can be found in section Time Synchronization on page 20.

2.5 LED Display

Description

The CANcaseXL/log has three LEDs for each channel (Channel1 and Channel2). The LEDs indicate the direction of the message and any error frame that occurs:

Rx	Tx	Err	Meaning
(( ))	-	-	Active if messages are being received.
-	(( ))	-	Active if messages are being sent.
-	-	(( ))	Active if error events occur on the bus. Only in Logger Mode: Blinking LED means that the related channel **is not** „on bus“.

(( )) : Blinking or flashing LED.

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2.6 Additional Features on CANcaseXL log

2.6.1 Operating Modes

Description

The CANcaseXL log supports two operating modes which can be switched by using the USB connection and power supply respectively:

USB connection	Req. ext. voltage supply	Mode
yes	optional	Interface / Logger configuration
no	yes	Logger

Interface Mode

In Interface Mode, the CANcaseXL log operates as a CAN/LIN interface between a PC and the bus. Messages can be received and sent over both channels with suitable tools.

Logger Mode

The Logger Mode enables the PC independent usage of the CANcaseXL log and allows the logging of CAN and LIN events. For this purpose the CANcaseXL log must be unplugged from the USB connector of the PC and externally supplied via the Binder connector.

Note: For the Logger Mode configuration, the additional tool XL log Config is available on the driver CD: `\Tools\CANcaseXL_log`.

Warning: During logging, the CANcaseXL log may not be connected to the PC via the USB cable, since the Logger Mode would otherwise be exited! However, the CANcaseXL log must be in the Interface Mode to configure the Logger Mode.

2.6.2 Additional LEDs

Status and Data

The CANcaseXL log has additional LEDs for **Status** and **Data** with the following meaning:

Status	Data	Meaning
off	off	Device is not operating. Device is in Interface Mode without SD card.
green	*	Device is in Interface Mode with a valid SD card.
red	*	Device is in Interface Mode with an invalid SD card.
orange	orange	Device is booting in Logger Mode.
green	off	Device is waiting for an SD card.
green	((green))	Device is accessing the SD card.
((green))	*	Device is ready for logging. Device is waiting for trigger.
((red))	off	Device reports an error and stops logging.

Status	Data	Meaning
((orange))	*	Warning: The SD card contains less than 10% of free space. The logging is not stopped.
*	((orange))	Warning: Critical data rate, but no messages are lost. The logging is not stopped. The LED state will change when the critical data rate decreases.
*	((red))	Error: Too high data rate, messages are lost. The logging is not stopped but the LED state will not change till the device is rebooted.

* : Alternating state of the LED, depending on data transmission.
(( )) : Blinking or flashing LED.

2.6.3 Piezo Buzzer

Trigger event signals

The CANcaseXL log has a piezo buzzer that acoustically alerts the user to internal trigger events. Triggers may be defined using the XL log Config configuration tool (driver CD: `\Tools\CANcaseXL_log`).

2.6.4 Memory Card

Inserting and removing the SD card

The CANcaseXL log has a push-and-pull card holder in which the SD card is inserted and removed. To insert a SD card push it until it latches in place securely. To remove the SD card push it into the holder slot a little bit until it unlatches then let it go and it will spring out of its latched position.

Warning: Do not pull the SD card from the card holder forcefully, since this could cause mechanical damage!

Formatting the SD card

Before the SD card can be used it has to be formatted with the configuration tool XL log Config (driver CD: `\Tools\CANcaseXL_log`).

Memory requirements

A single CAN message needs up to 20 byte, a single LIN message needs up to 108 bytes on the memory card.

CardFix Kit

The standard delivery of the CANcaseXL log allows the user to insert and remove the SD card from outside. In some situations, e.g. to prevent thefts, the inserted SD card shall not be removable. The CardFix Kit is a good protection because the back side plate with the SD card slot is replaced by a closed plate. Thus the SD card cannot be removed so easily anymore. The CardFix Kit can be ordered at Vector (article number 07132).

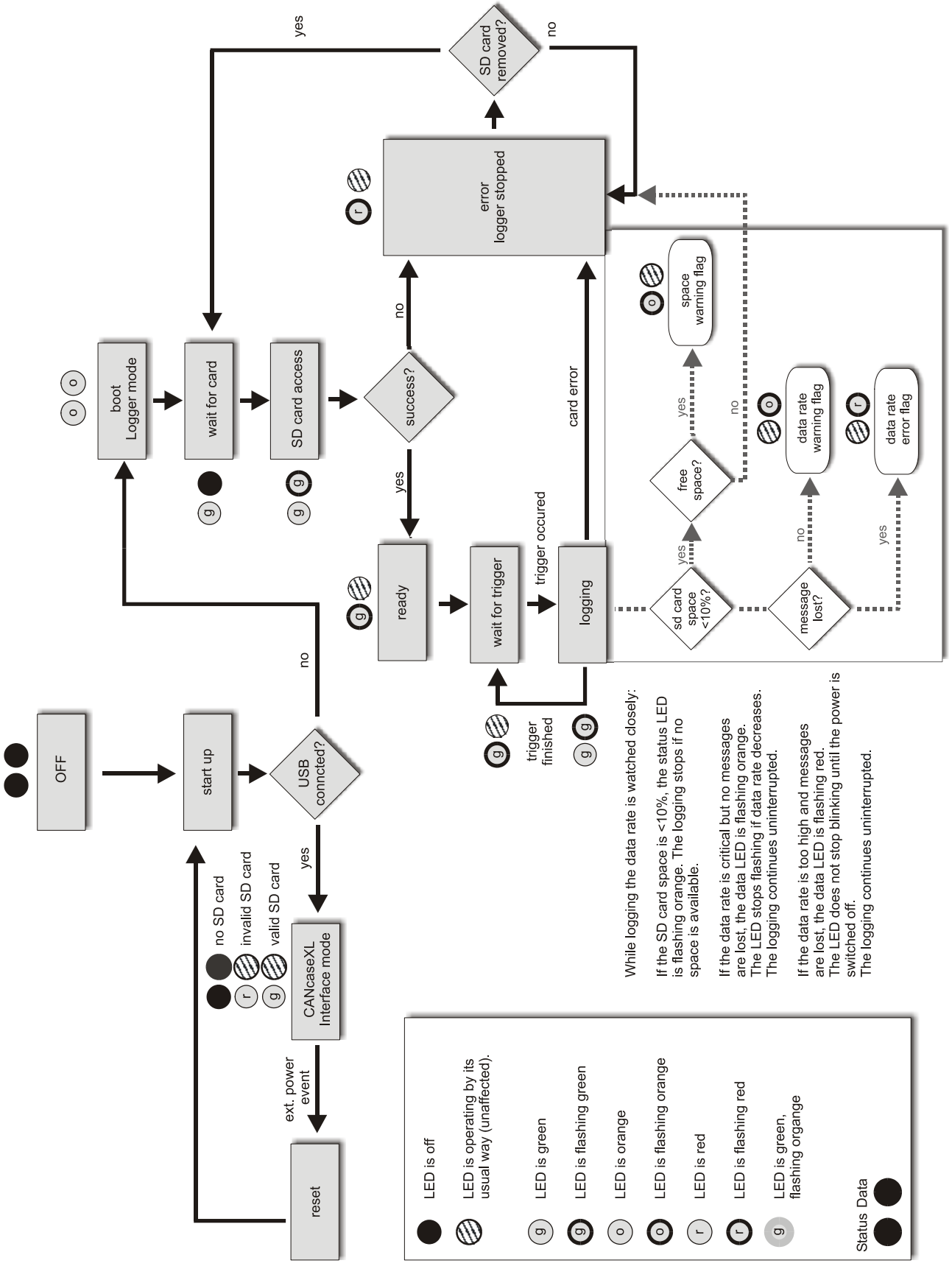
Warning: The CANcaseXL log must be opened for this modification! A detailed instruction is delivered with the kit. However, the modification of your CANcaseXL log can be done by our service.

2.6.5 Battery

Lifetime

The CANcaseXL log is supplied with a lithium battery that has a typical durability of 5 years. It is responsible for the correct timing of the integrated clock.

2.6.6 CANcaseXL log Flowchart


OFF
start up
USB connected?
yes
no
no SD card
invalid SD card
valid SD card
CANcaseXL Interface mode
ext. power event
reset
boot Logger mode
wait for card
SD card access
success?
no
yes
error logger stopped
SD card removed?
yes
no
ready
wait for trigger
trigger occured
logging
card error
trigger finished
free space?
space warning flag
sd card space <10%?
message lost?
data rate warning flag
data rate error flag
While logging the data rate is watched closely:
If the SD card space is <10%, the status LED is flashing orange. The logging stops if no space is available.
If the data rate is critical but no messages are lost, the data LED is flashing orange. The LED stops flashing if data rate decreases. The logging continues uninterrupted.
If the data rate is too high and messages are lost, the data LED is flashing red. The LED does not stop blinking until the power is switched off. The logging continues uninterrupted.
LED is off
LED is operating by its usual way (unaffected).
LED is green
LED is flashing green
LED is orange
LED is flashing orange
LED is red
LED is flashing red
LED is green, flashing organge
Status Data

2.7 Replacing Piggybacks

Warning: When performing this operation be sure not to touch the top or bottom of the boards (CANcaseXL/log main board or Piggybacks).

1. First, loosen the CANcaseXL/log housing screws on the side with the D-SUB9 connector. This requires removing the two black decorative caps. Then carefully pull the PC-board out of the housing.
2. You will find mounting location 1 (Channel 1) at the center of the PC-board and mounting location 2 (Channel 2) at the edge of the PC-board.
3. Each of the two Piggybacks is fastened by a screw and retainer. Please loosen the appropriate screw including the retainer and carefully remove the Piggyback from the mounting location.
4. Insert the replacement Piggyback. When doing this please make sure that the single and dual-row connectors are not laterally offset.
5. Secure the new Piggyback with the appropriate screw and retainer.
6. Place the CANcaseXL/log main board back in the housing verifying that it is inserted properly. This operation involves placing the housing on a table with its back side (side with the bar code) facing upward. Then the main board is inserted into the upper guide rails with the Piggybacks facing upward.
7. It should be possible to slide the main board in the housing up to a few millimeters from the end without forcing it in. Close the housing by applying light pressure, and then secure it with the appropriate screw fasteners. The screws should be secure but not excessively tight.
8. Please also attach the two black decorative caps.

2.8 Technical Data

CANcaseXL/log

Housing	Robust metal housing
Display	Status display with three LEDs per channel
Channels	2x, independent
Transceiver	Pluggable CANpiggies or LINpiggies
CAN controller	2 Phillips SJA 1000
Microcontroller	ATMEL AT91R40008 32 bit 64 MHz
Max. baud rate	1 Mbit/s
Time stamp accuracy	1 µs
Error frame	Detecting and generating
PC interface	USB 1.1 and 2.0
Ext. Voltage supply (typ.)	7 V … 33 V
Current supply	by USB, external supply optional
Current consumption (without SD card)	90 mA (12 V) for CANcaseXL/log Typ. 30 mA for CANpiggy 251
Memory media	SD card (max. 2 GB)
Configuration	Plug & Play
Dimensions	approx. 105 mm x 85 mm x 32 mm
Weight	approx. 210 g without CANpiggies
Temperature range	Operating: -20...70 °C Shipping and storage: -40...85 °C
Relative humidity of ambient air	15 %...95 %, not condensation
Software requirement	Windows XP (SP3) Windows Vista (SP1) Windows 7

CANcaseXL log

Operating modes	Interface and Logger
Memory function	Logging on SD card
Additional display	Status display with two LEDs
Extras	Real time clock and piezo buzzer
Startup time (logger mode)	1 second after switching on
Current supply	External in Logger Mode

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3 CANcaseXL/log Accessories

In this chapter you find the following information:

3.1 Accessories page 18

3.1 Accessories

Reference: Further information about the available accessories can be found in the separate accessories manual on the driver CD:
`\Documentation\Accessories_for_Network_Interfaces.pdf`

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4 Common Features

In this chapter you find the following information:

4.1	Time Synchronization General Information Software Sync Hardware Sync	page 20

4.1 Time Synchronization

4.1.1 General Information

Time stamps and events

Time stamps are useful when analyzing incoming or outgoing data or event sequences on a specific bus.

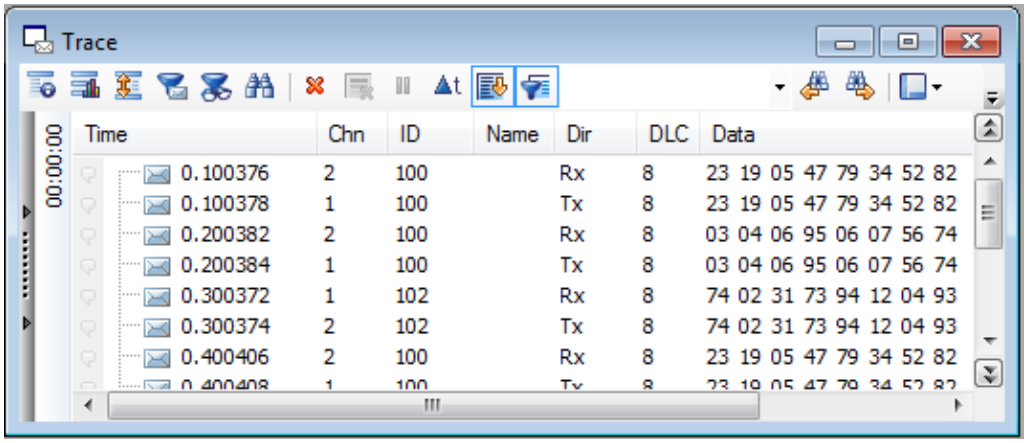

Figure 1: Time stamps of two CAN channels in CANalyzer.

Generating time stamps

Each event which is sent or received by a Vector network interface has an accurate time stamp. Time stamps are generated for each channel in the Vector network interface. The base for these time stamps is a common hardware clock in the device.

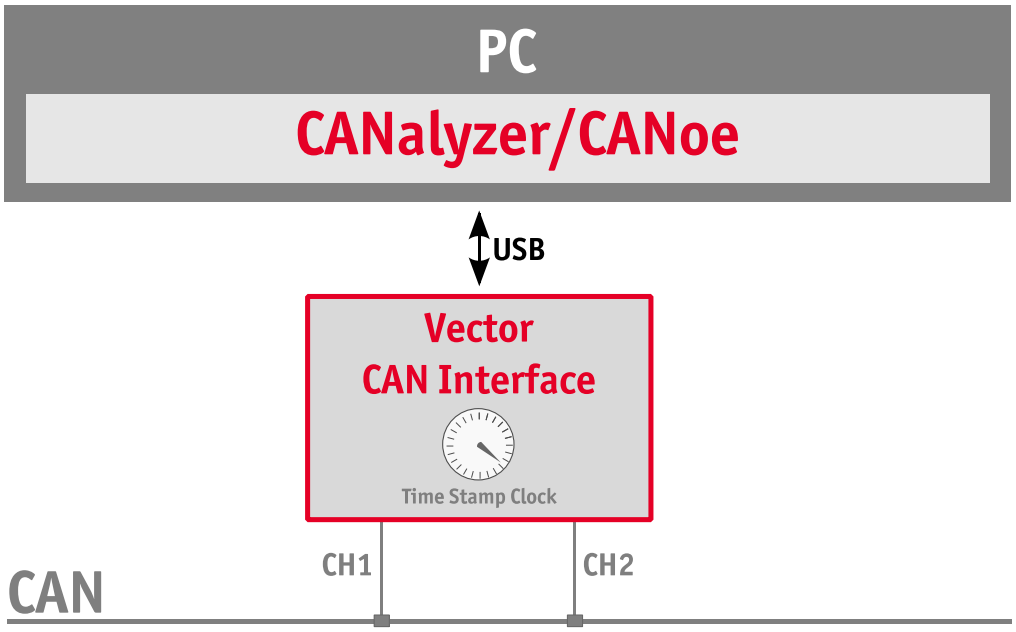

Figure 2: Common time stamp clock for each channel.

If the measurement setup requires more than one Vector network interface, a synchronization of all connected interfaces and their hardware clocks is needed.

Due to manufacturing and temperature tolerances, the hardware clocks may vary in speed, so time stamps of various Vector devices drift over time.

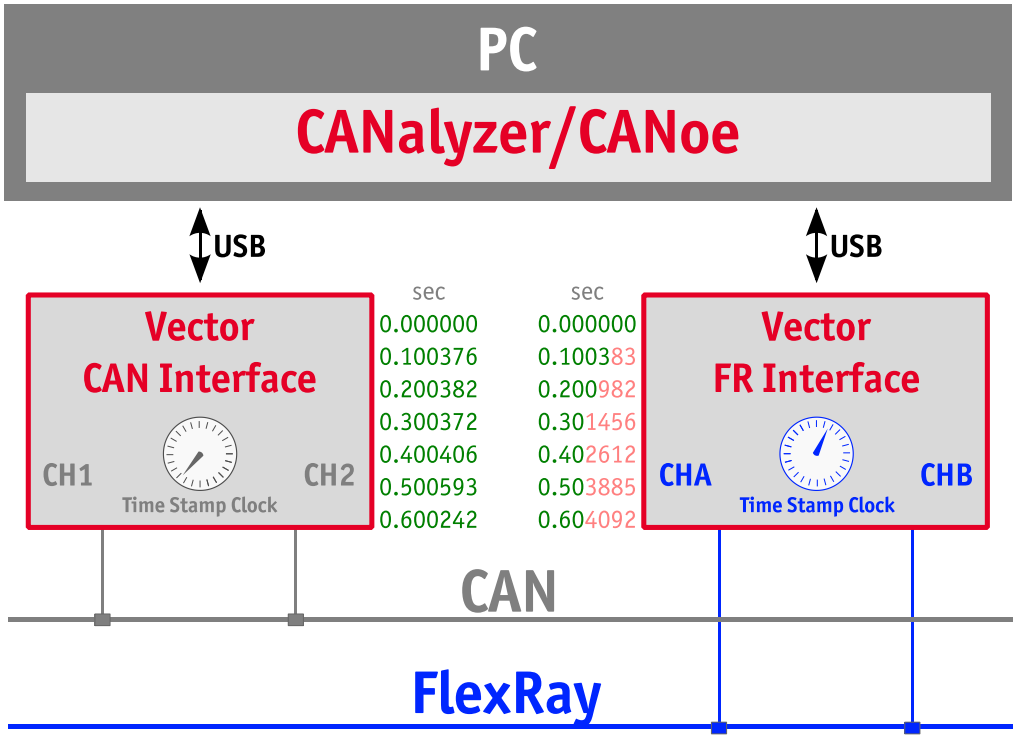

Figure 3: Example of unsynchronized network interfaces. Independent time stamps drift apart.

To compensate these time stamp deviations between the Vector network interfaces, the time stamps can be either synchronized by software or by hardware (see next section).

Note: The accuracy of the **software sync** is typically in range of **100 µs**.

Note: The accuracy of the **hardware sync** is typically in range of **1 µs**.

4.1.2 Software Sync

Synchronization by software

The software time synchronization is driver-based and available for all applications without any restrictions. The time stamp deviations from different Vector network interfaces are calculated and synchronized to the common PC clock. For this purpose no further hardware setup is required.

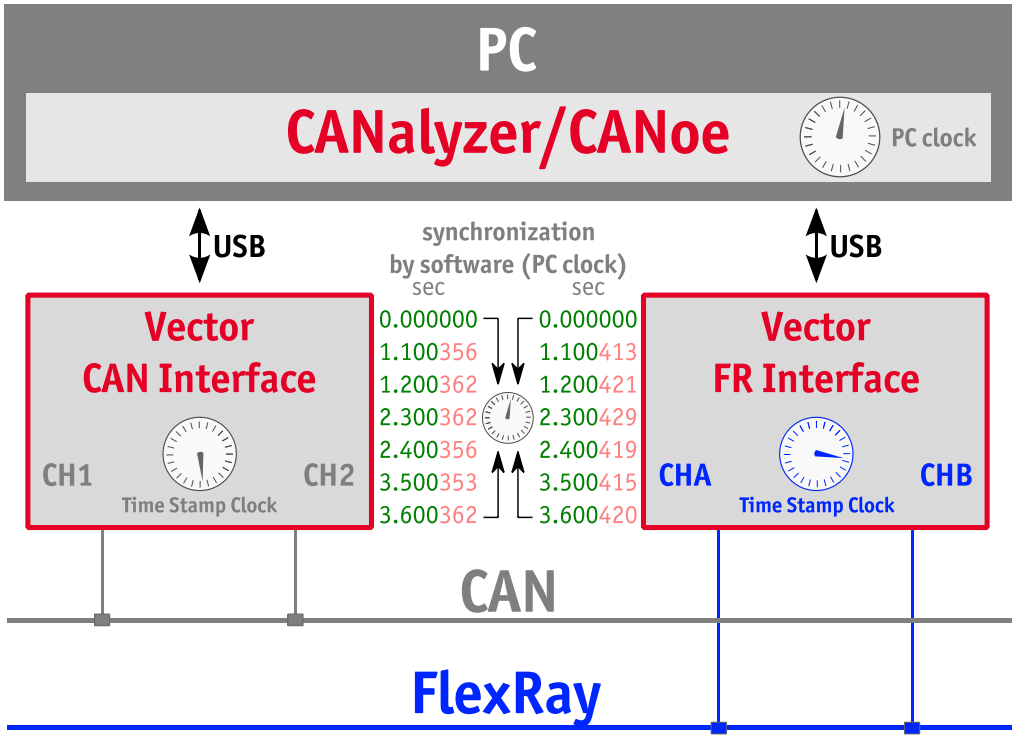

Figure 4: Time stamps of devices are synchronized to the PC clock (accuracy in range of 100 µs).

The setting of the software time synchronization can be changed in the **Vector Hardware Config** tool in **General information | Settings | Software time synchronization**.

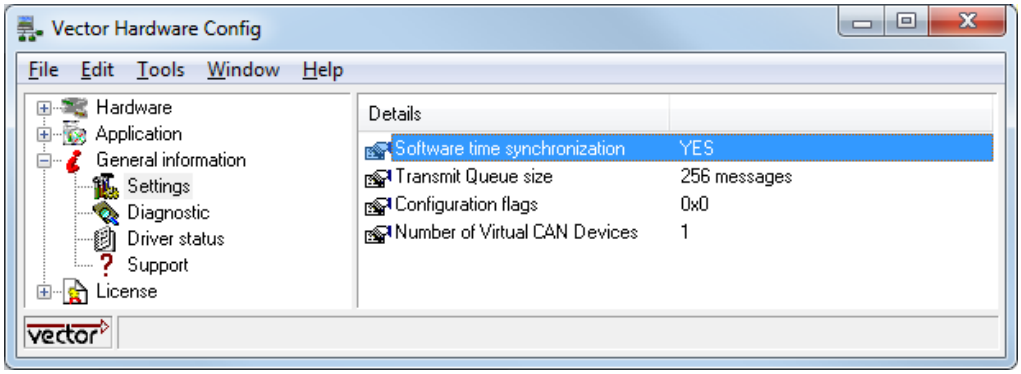

Figure 5: Switching on the software synchronization.

➔ **YES**
The software time synchronization is active.

➔ **NO**
The software time synchronization is not active.
Use this setting only if the Vector network interfaces are being synchronized over the sync line or if only a single device is used.

4.1.3 Hardware Sync

Synchronization by hardware

A more accurate time synchronization of multiple devices is provided by the hardware synchronization which has to be supported by the application (e. g CANalyzer, CANoe). Therefor two Vector network interfaces can be connected with the SYNCcableXL (see accessories manual, article number 05018).

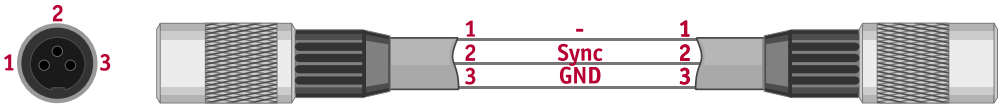

Figure 6: SYNCcableXL to synchronize two devices over 3-pin connector (Binder type 711).

In order to synchronize up to five devices at the same time, a distribution box is available (see accessories manual, article number 05085).

At each falling edge on the sync line which is initiated by the application, the Vector network interface generates a time stamp that is provided to the application. This allows the application to calculate the deviations between the network interfaces and to synchronize the time stamps to a common time base (master clock) which is defined by the application.

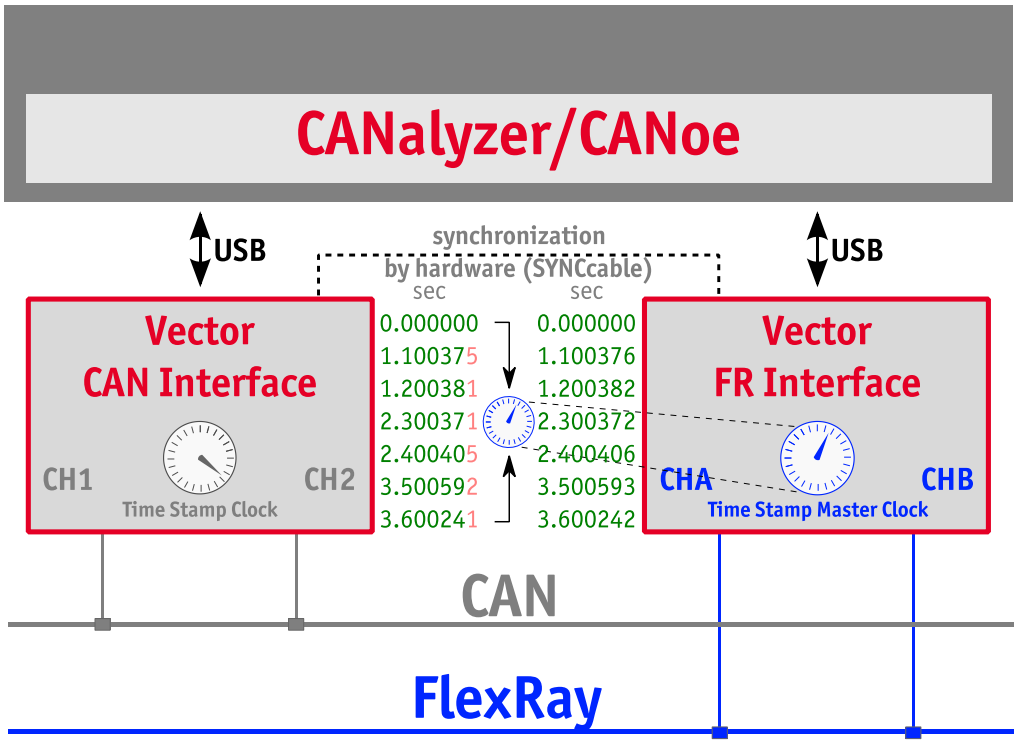

Figure 7: Time stamps are synchronized to the master clock (accuracy in range of 1 µs).

Note: The hardware synchronization must be supported by the application. For further information please refer to the relevant application manual. Please note that the software synchronization must be disabled (see **Vector Hardware Config | General information | Settings | Software time synchronization**) if the hardware synchronization is used.

5 Driver Installation

In this chapter you find the following information:

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5.3	Vector Driver Setup	page 27
5.4	Vector Hardware Configuration	page 29
5.5	Loop Tests CAN FlexRay MOST Ethernet	page 31

5.1 Minimum Requirements

Hardware

CPU	Pentium 4 or higher
Memory	512 MB or more
Network interface	CANcardXL : PCMCIA CANcardXLe : ExpressCard 54 CANboardXL PCI : PCI CANboardXL PCIe : PCI Express 1x CANboardXL PXI : Compact PCI/PXI CANcaseXL : USB CANcaseXL log : USB VN1610 : USB VN1611 : USB VN1630 : USB VN1640 : USB VN2610 : USB VN2640 : USB VN3300 : PCI VN3600 : USB VN5610 : USB VN7570 : PCI Express 1x VN7600 : USB VN8910 : USB

Software

Operating system	Windows XP SP3 (32 bit) Windows Vista SP1 (32 bit) Windows 7 (32/64 bit)
Driver version	8.x
Measurement application	The devices can be run with several applications from Vector (e. g. CANoe, CANalyzer) or with measurement applications from other companies. Therefor the devices require a related license. Applications based on the Vector XL Driver Library can be run without a license.

5.2 Hints

Note: Many desktop PCs have power managers which block the CPU for a specific time. This impairs accuracy of the time system. If your application has stringent timing requirements (e. g. time-driven sending of messages or time-driven evaluations), you have to deactivate these power managers. Power management settings may be contained in the BIOS setup or on the Control Panel of Windows XP / Vista / Windows 7 (e. g. Power options).

No further mention will be made of the power manager in this document.

Info: Please note that you will need **Administrator Rights** for the following steps.

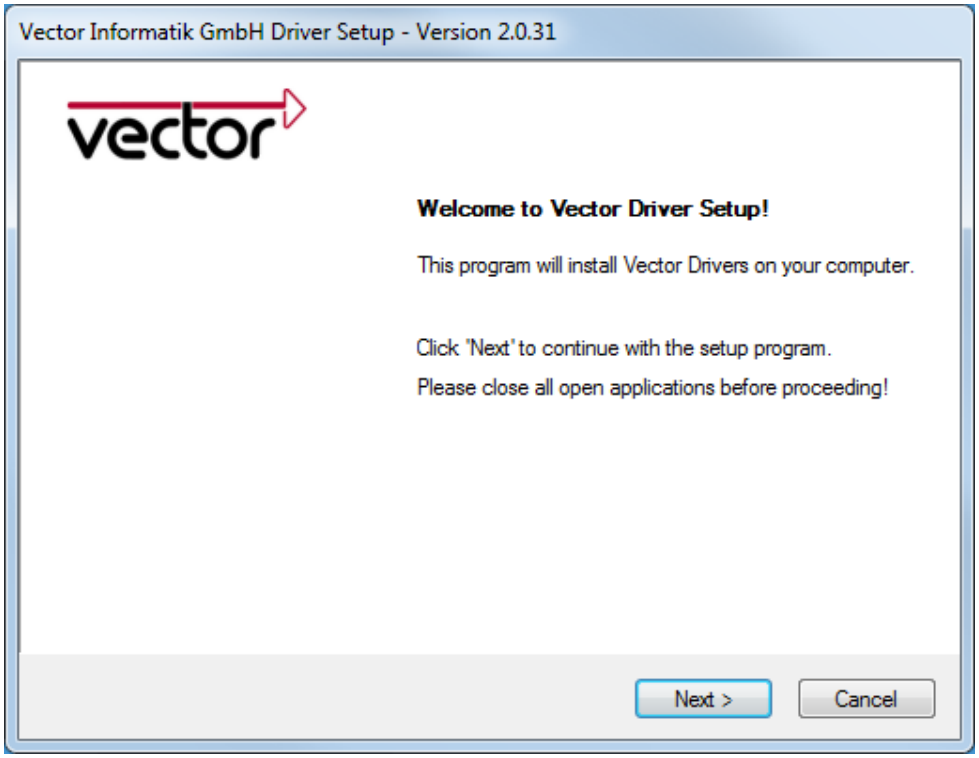
5.3 Vector Driver Setup

General information

The Vector Driver Disk offers a driver setup which allows the installation or the removal of Vector devices.

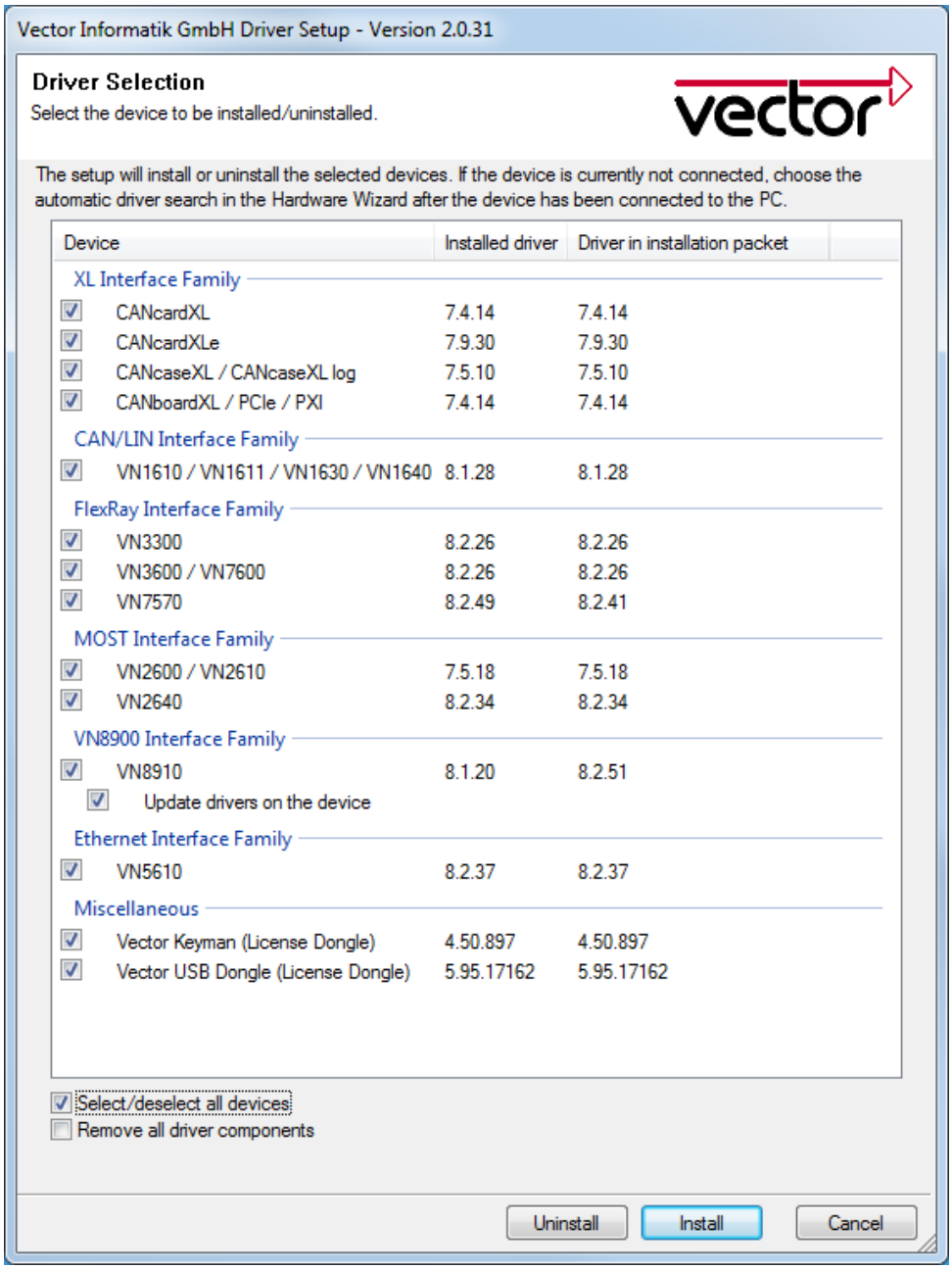
1. Execute the driver setup from the autostart menu or directly from `\Drivers\Setup.exe` before the device is inserted or connected to the PC with the included USB cable.

   If you have already inserted or connected the device to the PC, the **Windows found new Hardware** wizard appears. Close this wizard and then execute the driver setup.


Vector Informatik GmbH Driver Setup - Version 2.0.31
vector
Welcome to Vector Driver Setup!
This program will install Vector Drivers on your computer.
Click 'Next' to continue with the setup program.
Please close all open applications before proceeding!
Next >
Cancel

2. Click **[Next]** in the driver setup dialog. The initialization process starts.

3. In the driver selection dialog select your devices to be installed (or to be uninstalled).


Vector Informatik GmbH Driver Setup - Version 2.0.31
Driver Selection
Select the device to be installed/uninstalled.
vector
The setup will install or uninstall the selected devices. If the device is currently not connected, choose the automatic driver search in the Hardware Wizard after the device has been connected to the PC.
Device
Installed driver
Driver in installation packet
XL Interface Family
CANcardXL 7.4.14 7.4.14
CANcardXLe 7.9.30 7.9.30
CANcaseXL / CANcaseXL log 7.5.10 7.5.10
CANboardXL / PCIe / PXI 7.4.14 7.4.14
CAN/LIN Interface Family
VN1610 / VN1611 / VN1630 / VN1640 8.1.28 8.1.28
FlexRay Interface Family
VN3300 8.2.26 8.2.26
VN3600 / VN7600 8.2.26 8.2.26
VN7570 8.2.49 8.2.41
MOST Interface Family
VN2600 / VN2610 7.5.18 7.5.18
VN2640 8.2.34 8.2.34
VN8900 Interface Family
VN8910 8.1.20 8.2.51
Update drivers on the device
Ethernet Interface Family
VN5610 8.2.37 8.2.37
Miscellaneous
Vector Keyman (License Dongle) 4.50.897 4.50.897
Vector USB Dongle (License Dongle) 5.95.17162 5.95.17162
Select/deselect all devices
Remove all driver components
Uninstall
Install
Cancel

4. Click **[Install]** to execute the driver installation, or **[Uninstall]** to remove existing drivers.

5. A confirmation dialog appears. Click **[Close]** to exit.
If the driver has been properly installed, the device can be inserted or connected to the PC with the included USB cable. The device is ready for operation now.

6. For Windows XP users only:
If the **Windows found new Hardware** wizard appears, select the option for automatic driver search to complete the installation.

5.4 Vector Hardware Configuration

Executing Vector Hardware Config

After the successful installation you will find the configuration application **Vector Hardware** in the Control Panel (see below). The tool gives you information on the connected and installed Vector devices. There are also several settings that can be changed.

Control panel Windows XP

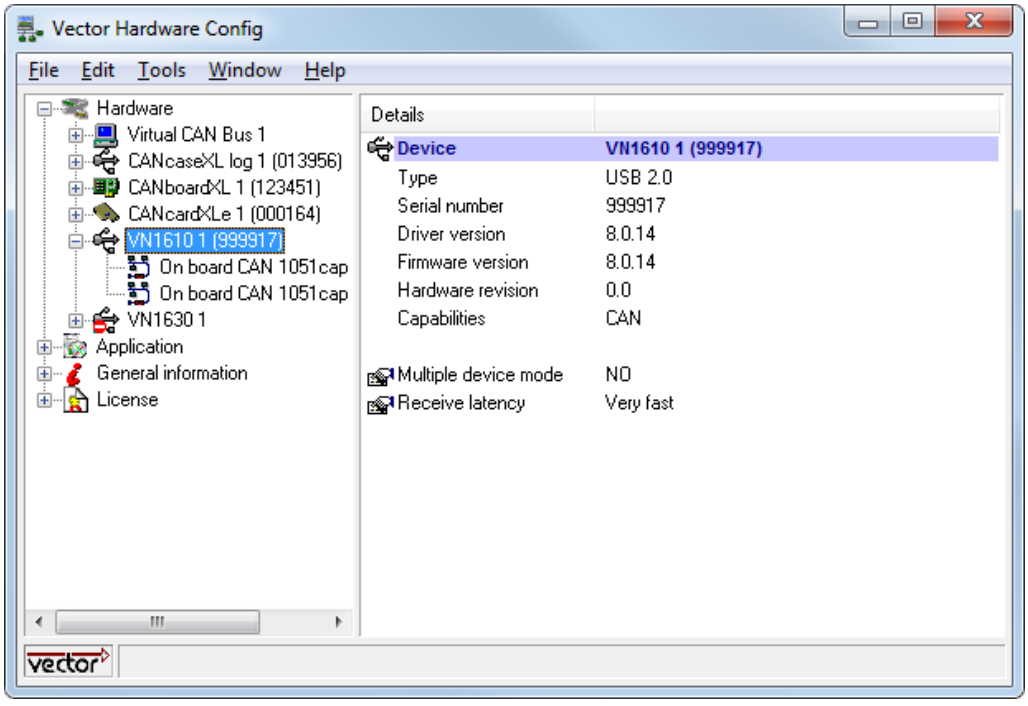
- Category view
  Start | (Settings) | Control Panel, click in the left part of the window for further Control Panel options followed by **Vector Hardware**.
- Classic view
  Start | (Settings) | Control Panel, click **Vector Hardware** in the list.

Control panel Windows Vista

- Category view
  Start | (Settings) | Control Panel, click in the right part of the window for Additional Options followed by **Vector Hardware**.
- Classic view
  Start | (Settings) | Control Panel, click **Vector Hardware** in the list.

Control panel Windows 7

- Category view
  Start | Control Panel | Hardware and Sound, click **Vector Hardware** in the list.
- Symbols view
  Start | Control Panel, click **Vector Hardware** in the list.



The tool is split into two windows. The left window lets you access the installed Vector devices, the right window displays the details of the selection. The following nodes are available in the left window:

Hardware

Each installed Vector device is shown in **Hardware**. Additional details of available channels are shown in a tree view. Status information on the device components and the channels are also shown in this dialog.

Application

In **Application**, all available applications are shown with their configured channels. If you click on an application, all of its channels are displayed in the right pane on the screen.

General information

The **General information** section contains general information on Vector devices and applications.

License

The **License** section contains information on all currently valid licenses.

Note: You will find a detailed description of **Vector Hardware Config** in the online help (**Help | Contents**).

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5.5 Loop Tests

Operating test

The test described here can be performed to check the functional integrity of the driver and the device. This test is identical for Windows XP, Windows Vista, Windows 7 and independent of the used application.

5.5.1 CAN

Device test

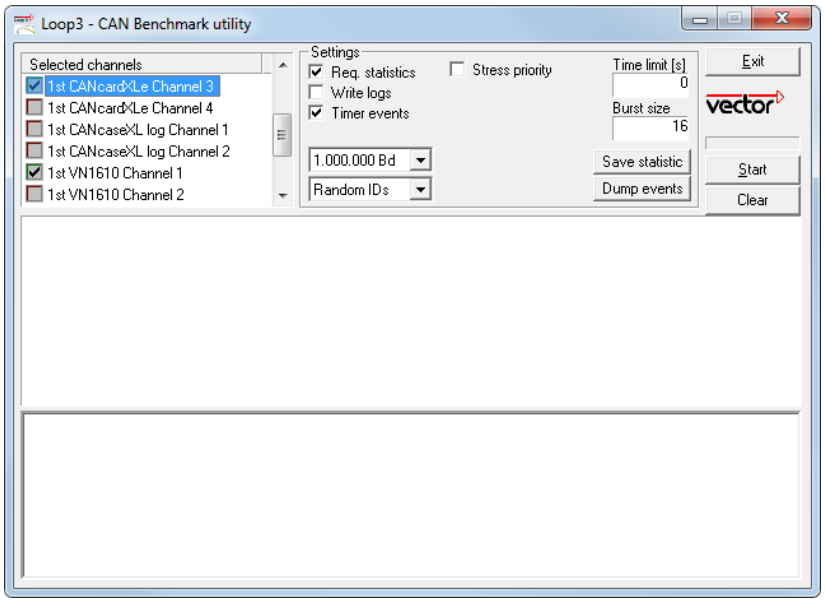
The operating test for CAN can be executed with the following devices:

- CANcardXL
- CANcardXLe
- CANcaseXL
- CANcaseXL log
- CANboardXL Family
- VN1610
- VN1630
- VN1640
- VN5610
- VN7570
- VN7600

Loop3.exe

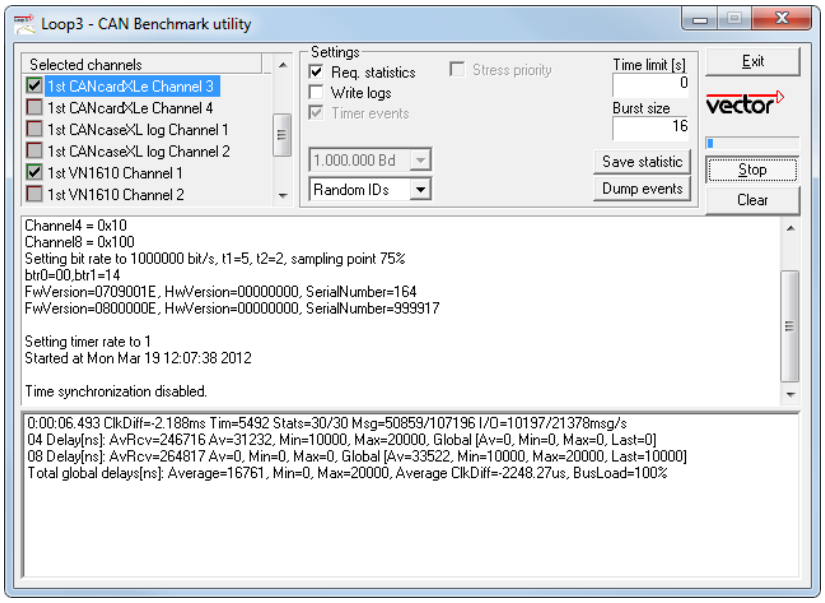
Either two High-Speed or two Low-Speed transceivers are necessary for this functional test:

1. Connect two CAN channels with a suitable cable. If two High-Speed transceivers are being used, we recommend our CANcable 1 (CANcable 0 for Low-Speed transceivers).
2. Start `\Drivers\Common\Loop3.exe` from the driver CD.
   This program accesses the Vector devices and transmits CAN messages.
3. Select the connected CAN channels of the device(s) to be tested.
4. Set the appropriate baudrate depending on the transceiver being used (High-Speed max. 1,000,000 Bd, Low-Speed max. 125,000 Bd).

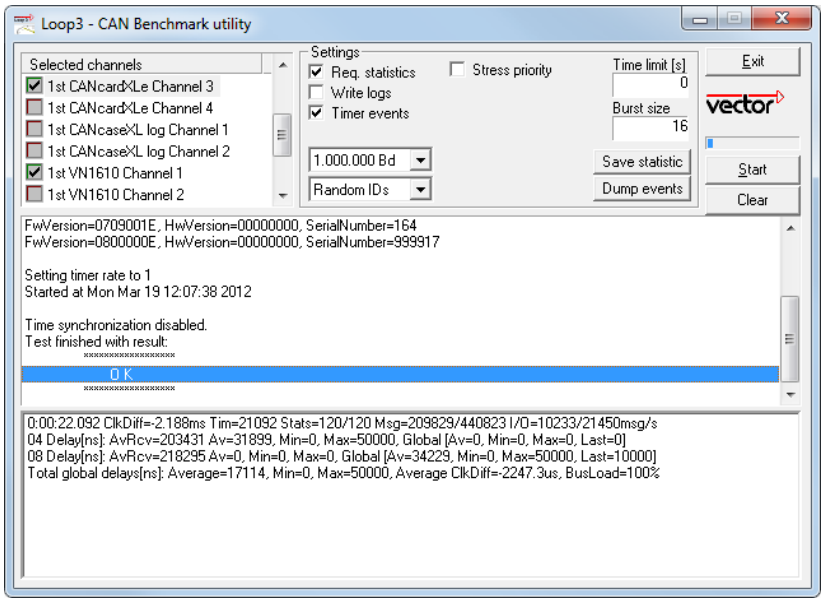


5. Click **[Start]**.
6. You will see statistical data in the lower part of the window if the system has been configured properly.

Loop3 application



7. The test procedure can be terminated with the **[Stop]** button.
   An **OK** should appear in the upper part of the window.


Loop3 - CAN Benchmark utility
Selected channels
1st CANcardXLe Channel 3
1st CANcardXLe Channel 4
1st CANcaseXL log Channel 1
1st CANcaseXL log Channel 2
1st VN1610 Channel 1
1st VN1610 Channel 2
Settings
Req. statistics
Write logs
Timer events
Stress priority
Time limit [s]
0
Burst size
16
1.000.000 Bd
Random IDs
Save statistic
Dump events
Exit
vector
Start
Clear
FwVersion=0709001E, HwVersion=00000000, SerialNumber=164
FwVersion=0800000E, HwVersion=00000000, SerialNumber=999917
Setting timer rate to 1
Started at Mon Mar 19 12:07:38 2012
Time synchronization disabled.
Test finished with result:
****
O K
****
0:00:22.092 ClkDiff=-2.188ms Tim=21092 Stats=120/120 Msg=209829/440823 I/O=10233/21450msg/s
04 Delay[ns]: AvRcv=203431 Av=31899, Min=0, Max=50000, Global [Av=0, Min=0, Max=0, Last=0]
08 Delay[ns]: AvRcv=218295 Av=0, Min=0, Max=0, Global [Av=34229, Min=0, Max=50000, Last=10000]
Total global delays[ns]: Average=17114, Min=0, Max=50000, Average ClkDiff=-2247.3us, BusLoad=100%

5.5.2 FlexRay

Device test

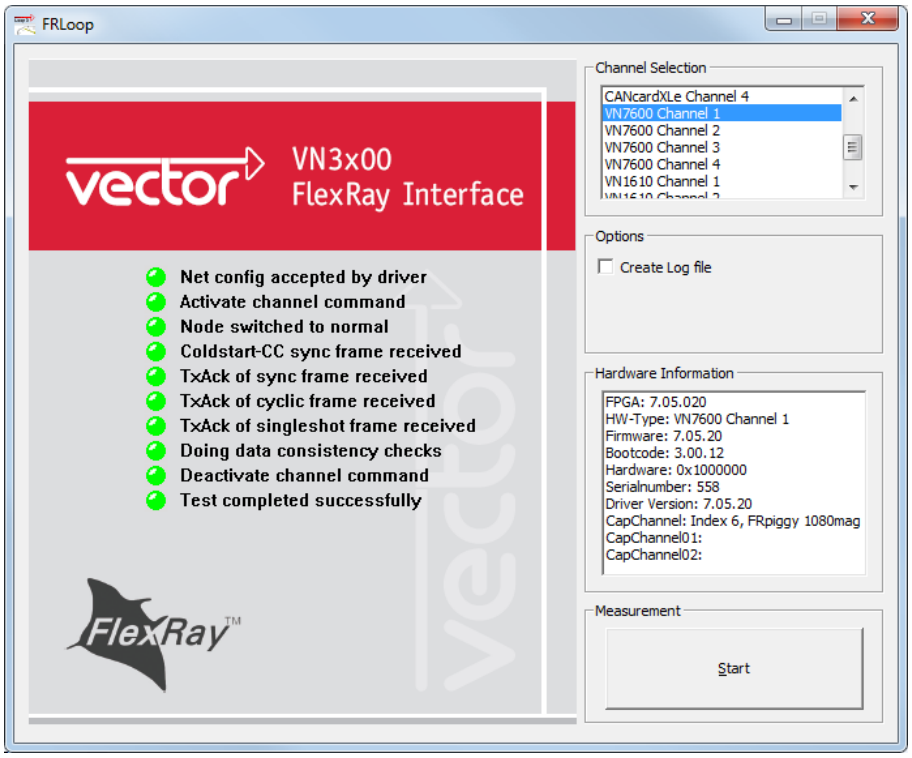
The operating test for FlexRay can be executed with the following devices:

- VN3300
- VN3600
- VN7570
- VN7600

FRLoop.exe

This operating test requires an inserted FRpiggy.

1. Remove the FlexRay cable if it is connected.
2. Start `\Drivers\Common\FRLoop.exe` from the driver CD.
3. Execute the test.
4. If no error messages occur, the operating test was successful.



5.5.3 MOST

Device test

The operating test for MOST can be executed with the following devices:

- VN2610
- VN2640

MLoop.exe

This functional test requires a MOST fiber optic cable and a fiber coupler for HFBR connectors.

1. VN2610
   Start `\Drivers\Common\MLoop.exe` from the driver CD

   VN2640
   Start `\Drivers\Common\M150Loop.exe` from the driver CD.
2. Select the VN2610/VN2640 to be tested from the list of detected devices.
3. Click **[Twinkle]** and check if the power LED of the VN2610/VN2640 is blinking at least for one second.
4. Connect the MOST fiber optic cable with the VN2610/VN2640 device, select **Master** mode and check if the program displays the status **Unlock**. Check if red light comes out of the TX fiber of the MOST fiber optic cable.
5. Connect both ends of the fiber with one fiber coupler to a ring and check if the program displays the status **Lock**.
6. Close `MLoop.exe` with **[Exit]**.

5.5.4 Ethernet

Device test

The operating test for Ethernet can be executed with the following devices:

- VN5610

1. Connect both Ethernet channels of the VN5610 with an Ethernet cable.
2. Start `\Drivers\Common\ETHloop.exe` from the driver CD.
3. Select an installed VN5610 from the list.
4. Press **[Twinkle]** and check if the LED **Status** blinks.
5. Start the test by pressing the button **[Start Test]**. The test is successful if no error messages occur.

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